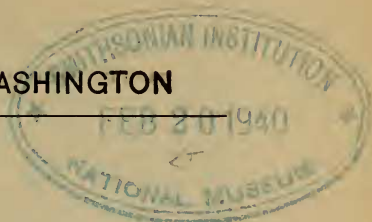


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NOTES ON KIT FOXES (*VULPES MACROTIS*) FROM
MEXICO.

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Little is definitely known concerning the distribution and systematic status of the kit fox (*Vulpes macrotis*) in Mexico. It has been stated that this species is present in the desert regions of Sonora and Chihuahua, but published records of specimens from definite localities are few or wanting. For this reason the results of study of kit foxes arising from attempts to identify specimens obtained in Sonora and Coahuila during 1937 should be of interest. It was found that one of the supposed geographic races of *Vulpes macrotis* is not recognizable, and that specimens from Coahuila, in addition to extending the known range of the species a long distance to the southeast, represent a geographic race different from those already known.

Specimens of kit foxes are not numerous in collections of mammals, probably because few collectors reach the areas where the habitat is suitable for kit foxes, and when they do, they usually pay more attention to the rodents there than to the carnivores. Furthermore, kit foxes are now as a rule few in number even in the areas which seem suitable to them. They are so unsuspecting that they are easily trapped and even more easily poisoned. Consequently, wherever trappers are active, and especially wherever control campaigns involving the use of poison have been carried out against predatory animals on areas inhabited by kit foxes, the foxes have been greatly reduced in number or entirely eliminated. Unfortunately, there are few kit fox habitats in the United States that escape visitation by these agencies.

There are now available in the Museum of Vertebrate Zoology 68 specimens of kit foxes from California, Nevada, Arizona, New Mexico, Sonora, and Coahuila. Most of these are winter-taken skins and skulls prepared by experienced collectors. This material is not sufficient in itself to serve as a basis for a revision of all the kit foxes, although study of this material and, especially, study of the published systematic accounts indicate that a thorough and careful revision of the group is greatly needed. However, it does provide a more adequate basis for determining the systematic status of the kit fox in southwestern Arizona and northwestern Sonora than has been available before this time.

SYSTEMATIC STATUS OF SONORA KIT FOXES.

Three kit foxes were obtained by Margarito Delgadillo and me in the period January 13 to 15, 1937, near the fishing village of Punta Peñasca on the Gulf of California in northwestern Sonora. The foxes were trapped in the sand dunes behind the beach about one mile north of the village.

It was expected that these specimens would be of the race *Vulpes macrotis arizonensis*, the range of which was given in the original description (Goldman, Journ. Washington Acad. Sci., vol. 21, 1931, p. 249) as "Desert region of southwestern Arizona and adjoining parts of Sonora." However, the specimens did not possess the characters ascribed to that race. This led to a careful study of other specimens from within the range of *arizonensis* and it was found that these also did not possess the characters of "*arizonensis*," at least to any marked degree. Furthermore, it was found that the Arizona specimens could not be distinguished from specimens of *V. m. arsipus* from the area west of the Colorado River in California and Nevada, although it was suggested in the original description of "*arizonensis*" that the river acted as barrier between "*arizonensis*" and *arsipus*.

The original description of "*arizonensis*" was based upon six specimens from localities as follows: Tacna, 1; Tule Tanks, 2; Yuma, 2; Vicksburg, 1. The Museum of Vertebrate Zoology contains 10 specimens from southwestern Arizona as follows: *Mohave County*: Fort Mohave, 1 (skin only); Mellen (=Topock), 1. *Yuma County*: Ehrenberg, 1; Wellton, 1; 1½ miles south Tinajas Altas, 1; 3 miles south Tinajas Altas, 5.

Specimens of *arsipus* are available from localities in California as follows: *Inyo County*: Kelly's Well, Amargosa River, 1; Death Valley, 1 (skull only); Triangle Spring, Death Valley, 2. *Los Angeles County*: Lovejoy Buttes (near Lancaster), 1 (skull only). *San Bernardino County*: Victorville, 2; Morongo Pass, 1; Colorado River, 29 miles south Needles, 2 (in collection of Ralph E. Ellis). *Imperial County*: Colorado River, opposite Cibola, 1; Colorado River, near Pilot Knob, 2.

Some specimens of kit fox from southern Nevada were also of value in working out the status of *arizonensis*. *Clark County*: near Mesquite, 5; Colorado River, 14 miles east Searchlight, 1 (skin only); Colorado River, opposite Fort Mohave, 1 (skull only).

According to the original description, "*arizonensis*" differs from *arsipus* in smaller size, shorter winter pelage, smaller brush, dorsum less heavily

overlaid with silvery-white. The last-named character was deemed especially worthy of note. Yet on careful comparison of the specimens, taking into consideration variations resulting from sex, age, and season, not one of these characters, nor any combination of them appears to have any correlation with geographic distribution. One specimen, from Wellton, collected November 6, 1931, by Bernard Bailey, does appear to have a considerably smaller amount of white on the dorsum, but this, together with the shortness of the pelage, is evidently the result of a stage in hair replacement, the white-banded guard hairs, and the fur hairs, not yet having grown out to full length. Specimens from near Tinajas Altas, which is only 13 miles west of the type locality of "*arizonensis*," are to me indistinguishable from comparable specimens of *arsipus* with regard to these characters. Measurements of the body and of the skull show nothing significant in the way of size differences between the populations on either side of the Colorado River.

Characters cited as differentiating the skull of "*arizonensis*" from *arsipus* are: "(1) sides of brain-case converging in more nearly straight lines (tending more distinctly to bulge outward in *arsipus*); (2) interpterygoid fossa narrower; (3) anterior processes of frontals broader, more prolonged, meeting ascending branches of premaxillae (frontal processes separated from ascending branches of premaxillae by a distinct gap along maxillo-nasal suture in *arsipus*)."

These skull characters, like the external characters, do not appear to have any geographic significance in the specimens available here. The first character appears to be more closely correlated with size and age than with geographic distribution. It can not be relied upon to distinguish "*arizonensis*" from *arsipus*. Unfortunately, this character is not easily measured with instruments, but must be judged by eye.

The second character, that of width of the interpterygoid fossa, does lend itself to measurement. In order to avoid error in judging the width, three measurements were made: (1) distance between the ends of the hamular processes of the pterygoids measured from the outside; (2) outside width across interpterygoid fossa at the juncture between palatine and pterygoid bones; (3) inside width of same place as in 2.

The first measurement could not be made in some of the specimens because the delicate pterygoids had been lost from some skulls or were loose or broken. Reliable measurements (all measurements given in millimeters) from three adult males of California *arsipus* were 7.5, 9.0, 9.3, while in four males of "*arizonensis*" measurements were 7.9, 8.2, 8.4, 10.0. Two females of California *arsipus* were 6.8, 7.3, while six female "*arizonensis*" were 7.9, 8.0, 8.1, 8.2, 8.2, 8.4. Thus the average of the males is the same. It is noteworthy that the largest measurement, indicating the widest interpterygoid space, is of an Arizona specimen.

The other two methods of measuring the fossa yield results so much alike that only the results of the third need be given here. In nine male specimens of California *arsipus* this distance ranges from 8.7 to 9.5 and averages 9.1. In five male "*arizonensis*" the distance ranges from 9.1 to 10.3 with an average of 9.6. In three female California *arsipus*, the range is from 7.8

to 10.0 with an average of 8.7. In six female "*arizonensis*" the range is from 8.1 to 9.3 with an average of 8.7.

These results indicate that, "*arizonensis*" does not have a narrower interpterygoid space than *arsipus*; indeed, the reverse condition seems to be indicated by these specimens. Yet the individual variation is so great that the slight average difference seems not to be significant. The conclusion may safely be drawn that the width of the interpterygoid fossa does not serve as a differentiating character between "*arizonensis*" and *arsipus*.

The third character, that of the width and prolongation of the anterior processes of the frontals, appears on inspection to be extremely variable. Comparable measurements of the width of the anterior processes can not be made satisfactorily because of great variations in shape, but the distance between the premaxillae and frontals on the surface of the skull can be measured with fair accuracy. Measurements were made on both the right and left sides, because it was evident on inspection that the two sides often were considerably different. For instance, in a specimen of *arsipus* from Kelly's Well, Amargosa River, the distance was 1.4 on the right and 4.3 on the left.

In nine male *arsipus* from California the distance between the frontals and premaxillae on the right side ranged from 0 to 4.8 and averaged 2.5; on the left, the range was from 0 to 4.9, averaging 3.1. In five male "*arizonensis*" on the right the range was 0 to 3.5, average 1.8, on the left, range from 0 to 4.3, average 1.9. In three female California *arsipus*, on the right, the measurements were 0, 2.6, 5.4; on the left, 2.0, 1.7, 4.8 respectively. In six female "*arizonensis*" on the right the range was 0 to 7.1, average 3.1; on the left 0 to 8.0, average 4.0.

These measurements reveal no significant differences between *arsipus* and "*arizonensis*" in this character. The two bones meet just as often in *arsipus* as in "*arizonensis*." The average difference between males and females of "*arizonensis*" is greater than the differences between males of "*arizonensis*" and *arsipus*. In addition, the greatest separation between the frontals and premaxillae was found in a female of "*arizonensis*," the reverse of what should be true according to the original diagnosis. It is therefore obvious that this character is so highly variable that it does not appear to have even a small amount of correlation with geographic distribution. The same can be said for the width of the frontal processes although these were not measured.

None of the characters listed as differentiating "*arizonensis*" from *arsipus* do so differentiate the 13 specimens from within the range of "*arizonensis*." Furthermore, no other differentiating characters were detected. As the number of specimens is greater than the number available to the original describer of "*arizonensis*" (six were listed in the original description), it may safely be assumed that they better represent the population inhabiting the region. Consequently, it may be concluded (1) that the name *V. m. arizonensis* is a synonym of *V. m. arsipus*, (2) that the Colorado River does not seem to be an effective barrier to kit foxes, and (3) that the kit foxes of northwestern Sonora are of the race *Vulpes macrotis arsipus*.

SYSTEMATIC STATUS OF COAHUILA KIT FOXES.

On June 15, 1937, three specimens of kit foxes were obtained from Guillermo Rodriguez who on that day trapped them near San Antonio de Jaral (El Jarral or Jaral of most maps) in southeastern Coahuila (approx. lat. 25° 40' N., long. 101° 25' W.). These are, I believe, the first kit foxes recorded from Coahuila and from any place so far to the southeast. The specimens, while definitely of the long-eared species (*Vulpes macrotis*) appear to represent a race hitherto undescribed which may be known as:

***Vulpes macrotis zinseri*, new subspecies.**

Type.—Adult male, skin and skull, no. 76292 Mus. Vert. Zool., collected by Guillermo Rodriguez at San Antonio de Jaral, southeastern Coahuila, Mexico, on June 15, 1937. Original number 2568 W. B. Richardson.

Distribution.—Known only from the type locality, but probably ranging in the desert plains of Coahuila and San Luis Potosí.

Diagnosis and comparisons.—A race of *Vulpes macrotis* characterized by large size (equal to *V. m. mutica* or *V. m. neomexicana*), dark color, heavy, wide-spreading zygomatic arches, and a generally rugose skull. Compared with *neomexicana*: *zinseri* differs in darker color, more rugose skull, anterior face of zygomatic arch more deeply excavated at juncture of maxilla and jugal, anterior part of zygomatic arches more bowed out anteriorly, post-orbital processes more strongly developed; base of zygomatic process of maxilla wider.

Color.—The color pattern of *zinseri* is the same as in other races of *Vulpes macrotis*, but the pigmentation is more intense. Compared with *neomexicana*, the increased intensity of pigmentation is especially apparent on the back of the ears, the limbs, the muzzle at the base of the vibrissae, and in the bases of the pigmented hairs over the whole body. Combined with the increase in intensity of dark pigmentation is an increase in the relative width of the dark-pigmented portions of the hairs, and a reduction in width of the light-colored bands. This is most noticeable on the face and dorsal surface. These characters are shown both in the hairs of the old winter coat and in the hairs of the new coat.

Measurements.—Adult male (type), adult female, and young adult female respectively: Total length, 822, 765, 725; tail, 325, 295, 287; hind foot, 123, 122, 120; ear from notch, 80, 79, 83; weight in grams, 2098, 1762, 1461. Skull: Total length (measured with calipers perpendicular to plane surface on which skull was resting dorsal side up), 116.1, 111.7, 108.9; condylobasal length, 112.1, 108.8, 107.4; greatest width of braincase, 43.7, 41.7, 42.4; greatest zygomatic width, 63.6, 61.3, 59.4; least width of rostrum (measured behind roots of canines), 18.4, 16.5, 16.6; least interorbital width, 23.8, 21.6, 21.6; maxillary toothrow (anterior face of canines to most posterior part of last molar), 53.2, 52.1, 50.1; length of pm¹ (crown length of outer side), 10.2, 10.0, 9.6; width of pm⁴ (anteriorly), 5.3, 4.8, 4.8.

Remarks.—This fox is named for Señor Juan Zinser, Jefe del Servicio de Caza, Departamento de Forestal y de Caza y Pesca, México, D. F.

More knowledge concerning the detailed distribution of the kit fox on the

Mexican Plateau must await the acquisition of more specimens and data. However, the distribution of the kit fox in the eastern part of its range so closely parallels the distribution of *Dipodomys spectabilis* that it is quite possible that this correlation exists in Mexico. If this is true the kit fox may be expected to occur as far south as the state of Aguas Calientes.

Descriptions of races of mammals are sometimes faulty in that they do not give enough information to allow the reader to judge the perspective from which the describer viewed the group being dealt with. For this reason I present some of the opinions concerning kit foxes that I have formed in the course of this study. One opinion is that kit foxes are so little known and apparently are becoming so rare, that every effort should be made to preserve as specimens the individuals that are killed. Another is that a thorough study of the variation and geographic distribution of the kit foxes is greatly needed. It is necessary for the user of the scattered systematic papers to have specimens at hand in order to find out the true characters of the geographic races. The descriptions are imperfect because most of them were based on limited material which did not permit an adequate appraisal of individual variation. As a result some of the characters supposedly diagnostic for the subspecies are not racial characters at all. In view of this, it was somewhat surprising to me to find that most of the races seem to be valid, even though the original descriptions did not always list the proper characters. A useful revision, therefore, must contain new definitions and diagnoses of the geographic races and give some account of the large amount of individual variation that exists in kit foxes. A mere list of the races recognized by the reviser, referring back to the original descriptions for characters, would not be helpful.

No specimens of the two races of *Vulpes velox* were available to me, so I can add no new information to the problem as to whether or not *velox* and *macrotis* are distinct species. For the same reason I can add nothing to the knowledge of *V. m. macrotis*, now probably extinct, of southern California, or of *V. m. tenuirostris* and *V. m. devia* of Lower California. However, specimens of the other races did give some basis for judging them. The race *V. m. mutica*, inhabiting the San Joaquin Valley and Walker Basin in California, is a strongly distinct form. The race *V. m. arsipus*, ranging east of the Pacific slope drainage, is

easily distinguishable from *mutica*. I have not seen a sufficient number of specimens from Nevada to be certain of the status of *V. m. nevadensis*, but specimens from southern Nevada are clearly *arsipus* and a few specimens from within the range ascribed to *nevadensis* also do not appear to differ from *arsipus*. I suspect that this race, if its distinctness from *arsipus* is confirmed by work on more material, will not be found to be a strongly marked one. The race *V. m. neomexicana* appears to be well marked.